

Situating Teachers' Computer Training within the Framework of Innovation Diffusion Theory

Abstract: Training teachers using computers is, in real measures, an issue of technology diffusion. Innovation diffusion theory provides a useful framework to guide teachers' computer training. Assisted by this framework, schools and computer trainers can identify effective training strategies by understanding what attracts potential adopters. Although training teachers using computers is a topic that has been discussed to a great extent, very rarely is this issue investigated in the light of technology diffusion. The purpose of this paper is to discuss teachers' computer training within the framework of innovation diffusion and identify effective training strategies accordingly.

As computer trainers, we all wish to unlock the secret on how to best train teachers using computers. Why is some training successful while others are not? Training teachers using computers is, in real measures, an issue of technology diffusion. If we look around in our daily life, we find ourselves face a similar puzzle: Why are some innovations adopted at a faster speed than others?

Rogers' (1996) landmark book *Innovation Diffusion* offers explanations to untangle this puzzle. Innovation diffusion theory considers that the rate of adoption of an innovation is determined by the following perceived attributes by its potential adopters: (1) relative advantage; (2) compatibility; (3) complexity; (4) trialability; and (5) observability. In his book, Rogers (1996) drew numerous examples from daily life to illustrate how each of these attributes impacts the diffusion process of an innovation.

I have been extensively involved in training teachers using computers. An article I published (Wang, 2000) on computer training triggered a flow of e-mail exchanges between readers and me. Readers' questions helped me to be reflective upon my training experiences and explore this issue from new perspectives.

Innovation diffusion theory provides a useful framework to guide teachers' computer training. Assisted by this framework, schools and computer trainers can identify effective training strategies by understanding what attracts potential adopters. Although training teachers using computers is a topic that has been discussed to a great extent, very rarely is this issue investigated in the light of technology diffusion. The purpose of this paper is to discuss teachers' computer training within the framework of innovation diffusion and identify effective training strategies accordingly.

Relative Advantages

"Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 1996, p. 212). According to Rogers, relative advantages include economic gains, status conferral, and other benefits such as the immediacy of the reward granted by the innovation to its potential adopters. A sharp drop of the price of a product tends to encourage its adoption (e.g. DVD player). People buy expensive clothes, watches, and cars just to satisfy their status desires.

The mentioning of relative advantages of computers brings to our minds a list of values of computers in teaching and learning. Nevertheless, teachers will not benefit from these advantages until they have reached a certain level of proficiency in using computers. Only after a tremendous investment of time and energy, can teachers be rewarded with the ease of using computers. Economic profitability helps encourage teachers to participate in computer training, especially at the initial training stage.

Economic profitability offered in schools is often expressed by granting teachers time release, offering stipend, and allowing computer equipment checked out (e.g. laptop, digital camera and etc.) if teachers agree to a number of hours of computer training. However, there are alternative relative advantages schools can employ to attract potential trainees.

The school where I conducted the computer training worked out a training program with a local university. The training courses were offered as university credit courses. The teachers could take the training courses for professional development and re-certification. During the exit interviews of the training, all of the teachers pointed out this benefit as a great motivation for them to complete the training. Teachers considered it important for them to take advantage of this opportunity to further their career. Re-certification ties directly to teachers' job status and salary increment, which represents a long-term relative advantage for teachers. In addition, teachers enjoyed the convenience to stay in school and work in a familiar environment with their colleagues being their fellow students.

While some computers are gathering dust in classrooms, schools could require teachers to complete computer training as a way of acquiring computers in the classroom. This requirement would put computers into good hands, ensuring its uses in the classroom. Meanwhile, this requirement represents multiple relative advantages to teachers. The placement of computers in classrooms provides teachers easy access to computers. Equally importantly, the acquisition of computers serves the purpose of status conferring. The school where I conducted the computer training placed two computers in classrooms as a reward to teachers who had completed their training. The teachers who did not get computers were bombarded by inquiries from their students: "How come we don't get computers in our classroom?"

Teachers enjoyed being viewed as professionals. Participating in computer training shows that these teachers are willing to take the challenge and care for their professional development. Even student comments help promote teachers' sense of professionalism: "Our teacher is taking a computer class now." Schools should publicize computer training, providing teachers opportunities to discuss what they have learned, and display teachers work, which will enhance the visibility of computer training and consequently, the teachers' images of being professionals.

Compatibility

"Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1996; p. 224). An innovation that is in conflict with the existing ideas or values would encounter resistance in its acceptance. Women in certain religious groups resist the use of birth control because this course of action is not compatible with their religious beliefs.

There has been an emphasis that computer training should aim at changing teachers' teaching styles. It concerns education reformers that teachers use technology to support and maintain existing teaching practices. These reformers argue that in order for computers to play a more successful role in classrooms, teachers need to adopt student-centered teaching styles. Therefore, training should gear towards changing the way teachers teach to fully harness the power of technology.

Tom Loveless (1996) presented a counter argument. He insisted that the computer should be used to help teachers do their job easily, not differently and that the computer use be unhitched from the reform movement to restructure schools and curriculum.

We can make considerable headway in getting teachers to use computers in instruction if we stop approaching the task as one of getting teachers to do their jobs differently and begin helping teachers to do their jobs as they do them now. This is hardly revelatory, for it describes the conditions that have favored the spread of innovations in other professions" (Loveless, 1996; p. 464).

Training would be more successful if it is compatible with teachers' values and beliefs. Research indicates that changing teachers' teaching styles is a long and slow process, which causes discomfort and uneasiness on the part of teachers (Sandholtz, Ringstaff, & Dwyer, 1997). It does not mean that teachers should maintain the status quo and not move on to develop new instructional strategies integrating computers. As teachers start experimenting with technology, they will gradually develop new teaching strategies to fully harness the power of the computer. The research by Becker and Ravitz (1999) found that teachers who used computers in classrooms for a period of three years were more likely to report changes in their teaching styles towards constructivist instructional approaches.

Teachers go through stages in applying computers to teaching practices (Sandholtz, Ringstaff, & Dwyer, 1997). These stages are: (1) Entry – Teachers set up computer equipment in the classroom setting. (2) Adoption - Teachers showed some interests in using computers in their teaching and they may use computers occasionally. (3) Adaption - Teachers integrated computers in teaching practices and used computers to support traditional teaching practice, for example, lecture, recitation, and seat work. (4) Appropriation - Teachers become proficient in using computers effortlessly as teaching tools to support their work. (5) Invention - Teachers start to experiment with new teaching strategies integrating computers in the curriculum.

When I trained teachers in integrating computers into the curriculum, I encouraged various teaching approaches. Teachers were free to experiment with computers the way they felt comfortable with, be it teacher-centered approaches or student-centered approaches. Teachers had positive experiences with the training. Although teachers insisted that the use of computers did not change their teaching styles, they commented that computers released their creativity: "It (creativity) is always there, but technology brings it out." Teachers might not be aware that their teaching styles were taking a change since the change is evolutionary and incremental.

The key for a successful training is to know at what stages teachers are, provide whatever assistance and training teachers need, and scaffold for teachers to transit to the next stage.

Complexity

Complexity is the degree to which an innovation is perceived as relatively difficult or easy to understand and use (Rogers, 1996, p.242). Innovations that are easy to use enjoy the smoother diffusion process. Cell phone has very simple user-interface. No one has to take time and efforts to learn how to use it.

The computer is a complex device. It requires users to have a high level of technical skills to operate a computer. Most teachers do not share this level of expertise. In addition, using computers in teaching goes beyond the mastery of technical skills. It is a formidable multi-dimensional task.

The best way to handle a multi-dimensional task is to divide the task into manageable subtasks. I designed a three-phase training model and field-tested it. The result was successful. These three training phases are familiarization, utilization, and integration.

Familiarization is a process of acquainting teachers with the computing environment. Teachers learn basic computer concepts and skills to get around in desktop working environment and be comfortable with the computer environment. The perceived complexity of the computer often terrifies teachers and disables them from learning. Initial training should gear towards dispelling teachers' fears and expanding teachers' comfortable zone. Strategies can be used to build teachers' confidence in handling computers. For example, ask teachers to crash the machine and then learn how to fix it. Humor also helps to reduce teachers' anxiety.

Utilization is a process of training teachers to use computers as personal production tools. Training at this phase was task-oriented. Teachers were introduced to a variety of computer tools to complete specific tasks. Teachers learn how to use computers to write lesson plans, prepare quizzes, create word puzzles, design classroom newsletters and record students' grades. The training emphasis of this phase is to utilize computers as tools to make teachers' job easier.

The third phase of training is integration. The focus of this phase of training is on integrating computers into the curriculum as teaching and learning tools. This phase is essential for the computer to have a real impact on teaching and learning. Teachers learn to use computers to present course content, illustrate difficult concepts, design learning activities integrating computers, and facilitate student-centered computer projects.

This three-phase training model helps make the training manageable. Teachers focus on a specific dimension of the task at each phase so as not to be overwhelmed with this multi-dimensional task.

The complexity of computer training requires a long-term commitment on the part of teachers and schools. It is unrealistic, and even detrimental for teachers or schools to think that through a few training workshops, teachers will become proficient computer users. Schools need to develop a long-range technology training plan. The school where I conducted teacher training planned and designed a three-year training program, offering various training courses to fit teachers' needs. Long-term computer training engages teachers in technology immersion, maintains teachers' interests, provides a sense of continuity, and allows trainers and trainees opportunities for follow-ups. Teachers need to be aware of and prepared for this long-term commitment on their part.

Trialability

"Trialability is the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1996, p. 243). An innovation that allows trying-out gives its potential adopters opportunities to find out whether it works under individual circumstances. Shareware is quite popular as a form of software since it allows users to have some period of time for free-trial before they decide to purchase it or not.

Teachers face uncertainty and insecurity when introducing computers into classrooms. Not only does it require teachers to have capabilities to handle computers, it also requires teachers to adapt to new teaching environments. Computers change social and organizational structure of the classroom. The prospect of computer glitches and classroom chaos understandably holds teachers back. Before using computers to teach a class, teachers should be allowed opportunities to experiment with the computer use with students on a small scale – a process of trialability.

During my computer training, I asked teachers to design a learning activity integrating computers by involving a small group of students. Teachers completed some quite successful projects. One teacher experimented with a group of three students on how to use a digital camera in the classroom setting. She designed a learning activity on using the digital camera to learn and practice sign language. Another teacher involved five students in doing a spreadsheet project. Each of the students brought a favorite food label from mom's kitchen and used the spreadsheet to graph the nutrition facts on the food labels. The students hypothesized and analyzed various charts generated by the spreadsheet, which led to the discussion on healthy diet. Teachers were quite encouraged by the success of these trial projects.

The opportunity of trialability provides teachers a controlled environment to practise their skills in handling computers, experimenting with new teaching strategies, and developing classroom management skills.. Trialability is a learning-by-doing process, which provides scaffoldings for teachers to move to real classroom situations.

Observability

"Observability" is the degree to which the results of an innovation are visible to others (Rogers, 1996, p. 244). The observable attribute of an innovation helps accelerate its adoption rate. One of the reasons for the cell phone to gain popularity is its high visibility in public. Yet the anti-drug campaign "Just say NO" has little success since its results are not observable.

One barrier to introduce computers in classroom settings is the difficulty to attribute student academic achievements to the use of computers. It is difficult to measure computers' impact on students learning outcomes in terms of test scores. Nevertheless, the positive learning experiences created by computers for students are observable and communicable.

My computer training always emphasizes the importance for teachers to share their students learning experiences. One second-grade teacher had the whole class work on a multimedia storybook by using hyperstudio. The children decided on the topic and brainstormed about the theme of the story. Each child contributed one sentence to the story, and then the whole class discussed whether the sentence made sense. In the process of creating this storybook, children learned vocabulary, sentence structures, and grammar. The coincidence is that the students took the national standard test soon after the project. After the test, several students told the teacher: "The test is long, but easy. We did some of it in our multimedia

storybook.” This learning experience, when shared, exerts a powerful influence upon other teachers in exploring innovative teaching strategies with computers.

Opportunities should be provided to showcase teacher and student work. Teachers can present their work at school faculty meetings, parent-teacher conferences, and local and national conferences. The lab can be an ideal place to display students’ work. This observability created by sharing motivates teachers to take efforts to experiment and innovate.

Conclusion

Training teachers using computers is a phenomenon that defies simplification. With computers assuming an increasingly important role in information age classrooms, it is essential to continue to explore effective strategies in training teachers using computers, which is the key to guarantee that the potential of technology impacting student learning be fulfilled.

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